W91321-04-C-0023

LOGANEnergy Corp.

McEntire ANGB PEM Demonstration Project
Midterm Report

Proton Exchange Membrane (PEM) Fuel Cell Demonstration
Of Domestically Produced PEM Fuel Cells in Military Facilities

US Army Corps of Engineers
Engineer Research and Development Center
Construction Engineering Research Laboratory
Broad Agency Announcement CERL-BAA-FY03

McEntire Air National Guard Base
Main Base Fire Station
Columbia, South Carolina

July 10, 2005

Executive Summary

Under terms of its FY'03 DOD PEM Demonstration Contract with ERDC/CERL, LOGANEnergy has installed and initiated the operation of a Plug Power GenSys5C 5kWe Combined Heat and Power fuel cell power plant at McEntire Air National Guard Base, located near Columbia, SC. The site selected for the one-year demonstration project is the McEntire ANGB Fire Station. The unit has been electrically configured to provide grid parallel/grid independent service to the facility, and it has also been thermally integrated with the facility's gas-fired water to support domestic thermal loads. Local electrical and mechanical contractors have been hired as necessary to provide services needed to support the installation tasks.

It is anticipated that the project will add $197.00 in annual energy costs to McEntire during the period of performance. The McEntire ANGB POC for this project is Lt. Col. Nelson McLeod whose coordinates are:
Tel: (803) 647-8606
Email: nelson.mcleod@scmcen.ang.af.mil

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Proposal – Proton Exchange Membrane (PEM) Fuel Cell Demonstration of Domestically Produced Residential PEM Fuel Cells in Military Facilities

1.0 Descriptive Title

LOGANEnergy Corp. Small Scale PEM 2004 Demonstration Project at McEntire ANGB located just outside of Columbia, SC

2.0 Name, Address and Related Company Information

LOGANEnergy Corporation
1080 Holcomb Bridge Road
BLDG 100- 175
Roswell, GA 30076
(770) 650- 6388

DUNS 01-562-6211
CAGE Code 09QC3
TIN 58-2292769

LOGANEnergy Corporation is a private Fuel Cell Energy Services company founded in 1994. LOGAN specializes in planning, developing, and maintaining fuel cell projects. In addition, the company works closely with manufacturers to implement their product commercialization strategies. Over the past decade, LOGAN has analyzed hundreds of fuel cell applications. The company has acquired technical skills and expertise by designing, installing and operating over 30 commercial and small-scale fuel cell projects totaling over 7 megawatts of power. These services have been provided to the Department of Defense, fuel cell manufacturers, utilities, and other commercial customers. Presently, LOGAN supports 30 PAFC, PEM, and Solid Oxide fuel cell projects at 21 locations in 12 states, and has agreements to install 22 new projects in the US and the UK over the next 18 months.

3.0 Production Capability of the Manufacturer

Plug Power manufactures a line of PEM fuel cell products at its production facility in Latham, NY. The facility produces three lines of PEM products including the 5kW GenSys5C natural gas unit, the GenSys5P LP Gas unit, and the GenCore 5kW standby power system. The current facility has the capability of manufacturing 10,000 units annually. Plug will support this project by providing remote monitoring, telephonic field support, overnight parts supply, and customer support. These services are intended to enhance the reliability and performance of the unit and achieve the highest possible customer satisfaction. Brian Davenport is the Plug Power point of contact for this project. His phone number is 518.782.7700, ext.1939, and his email address is brian_davenport@plugpower.com .

4.0 Principal Investigator(s)

Name	Samuel Logan, Jr.	Chris Davis
Title	President	Vice President Operations
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388 x 101	(860) 872-1120
Fax	770.650.7317	770.650.7317
Email	samlogan@loganenergy.com	cdavis@loganenergy.com

5.0 Authorized Negotiator(s)

Name	Samuel Logan, Jr.	Chris Davis
Title	President	Vice President Operations
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388 x 101	(860) 872-1120
Fax	770.650.7317	770.650.7317
Email	samlogan@loganenergy.com	cdavis@loganenergy.com

6.0 Past Relevant Performance Information

a) Contract: PC25 Fuel Cell Service and Maintenance Contract #X1237022

Merck & Company
Ms. Stephanie Chapman
Merck & Company
Bldg 53 Northside
Linden Ave. Gate
Linden, NJ 07036
(732) 594-1686

In November 2002 Merck & Company issued a four-year contract to LOGAN to provide fuel cell service, maintenance and operational support for one PC25C fuel cell installed at their Rahway, NJ plant. During the contract period the power plant has operated at 94% availability. LOGAN performs the quarterly and annual service prescribed by the UTC, and performs other maintenance as required. The periods of unavailability are chiefly due to persistent inverter problems that seem to be endemic to the Toshiba power conditioning balance of the system. Field modifications and operating adjustments have largely cured the problem. Quarterly service events take 10 hours to complete with the unit under load, and the annual event takes approximately 35 hours with the unit shut down.

b) Contract: Plug Power Service and Maintenance Agreement to support one 5kWe GenSys5C and one 5kWe GenSys5P PEM power plant at NAS Patuxant River, MD.

Plug Power
Mr. Scott Wilshire.
968 Albany Shaker Rd.
Latham, NY 12110
(518) 782-7700 ex 1338

LOGAN performed the start-up of both units after Southern Maryland Electric Cooperative completed most of the installation work. The units are located at residential sites at Patuxant

River Naval Air Station, MD and operate in standard gird connected/grid independent configurations. Both operate at 4.5kWe and have maintained 98% availability. The units, S/Ns 241 and 242 are two of the very latest GenSys models to reach the field. S/N 242 is Plug Power's first LPG fueled system to go into the field. Both have set new performance standards, and raised expectations for near term commercial viability for this product. Operations to date are indicative of the success of the various test and evaluation programs that have been conducted over the past two years.

c) Contract: A Partners LLC; Commercial PC25 Fuel Cell Project Design, Installation and 5-year service and maintenance agreement.

Mr. Ron Allison
A Partners LLC
1171 Fulton Mall
Fresno, CA 93721
(559) 233-3262

On April 20, 2004 LOGAN completed the installation of a 600kWe PC25C CHP fuel cell installation in Fresno, CA. The system operating configurations allow for both grid parallel and grid independent energy service. The grid independent system is integrated with a Multi Unit Load Sharing (MULS) electronics package and static switch, which initial development was funded by ERDC CERL in 1999. This is the third fuel cell installation that uses the MULS System. The thermal recovery package installed in the project includes a 100-ton chiller that captures 210 degree F thermal energy supplied by the three fuel cells to support cooling loads on the first three floors of the host facility. The fuel cells also provide low-grade waste heat at 140 degrees F that furnishes thermal energy to 98 water source heat pumps located throughout the 12-story building during the winter months.

7.0 Host Facility Information

McEntire Air National Guard Base (ANGB) is located approximately 16 miles southwest of Columbia, South Carolina. The 2,400-acre base is owned by the US Government and is operated by the South Carolina Air National Guard. McEntire ANGS owns 2,344 acres and leases approximately 64 acres from the State of South Carolina. Additionally, there is a small parcel of privately owned land within the base boundary; however, neither the leased land nor the privately owned land contains utilities.

The South Carolina Air National Guard was formed in December 1946 and today is made up of 1,300 members who train at McEntire ANG Station. The base is home to the 169th Fighter Wing, which flies the F-16 multi-role fighter. An Army National Guard aviation unit is also a tenant on the base.

The base has a total 95 buildings: 90 industrial, 4 administrative and one services totaling 263,000 square feet. There is no family or transient housing. New facilities under construction include an addition to the avionics building (2,500 square feet) and replacement of the air traffic control tower and aircraft support equipment facility (14,600 square feet total). Additionally, seven facilities totaling approximately 21,000 square feet were demolished in FY 2001. There are 550 full-time ANG personnel on base which increases to 1300 one weekend per month. Additionally, there is a small cadre of Army personnel on base, increasing to 400 every other weekend.

McEntire Air National Guard Base is named for the late Brigadier General Bernie B. McEntire, Jr., the first commander of the S.C. Air Guard and its first general officer. General McEntire died in May 1961 when he rode his malfunctioning F-104 into the Susquehanna River to avoid crashing in the populated area of Harrisburg, PA. The base was previously known as Congaree Air Base and was used in World War II as a U.S. Marine Corps training base.

8.0 Fuel Cell Installation

The photos in Figures 1 and 2, below, are pictures of the rear elevation of the fire station at McEntire ANGB, the original site for the PEM project. During the site evaluation performed by Mike Harvell of LOGAN and supported by Lt. Col McLeod on September 15, 2004, the parties agreed that the fire station would provide a good opportunity to install the fuel cell to best effect.

Figure 1 – Rear Elevation of McEntire Fire Station

Figure 2 – Fuel Cell Pad Site

The photo above in Figure 2 shows the Plug Power Gensys5C fuel cell on its pad in a niche formally occupied by a trash dumpster. The unit was delivered on October 15, 2004. Providing gas service for the fuel cell presented a new challenge for LOGAN, since the closest natural gas tie-in is on the roof of the building, some 100 feet from the unit. The safety concerns associated with running a connection to the natural gas line over such a long distance forced LOGAN to reconsider the proposed pad site in hopes of finding a more convenient location. In Figures 3 and 4, below, the safer, more suitable location for the fuel cell can be seen located much closer to the existing natural gas piping. This pad site is situated behind the McEntire ANGB Fire Station, and while this location does not afford as much visibility as the alternative, safety and peace of mind for the fire station residents was the ultimate goal of LOGAN technicians in this installation.

Figure 3 – Alternative Fuel Cell Pad Site

Figure 4 – Fuel Cell and Electrical Mounting Bracket

Figure 5 – Filtration/Comm. Hardware

The yellow piping seen in Figure 3 is the location of the natural gas tie-in used by LOGAN technicians to supply the fuel cell. Additionally, access to the mechanical room is much closer at this pad site than the former location near the fire station driveway. The door to the mechanical room is just to the right of the fuel cell in Figure 3, just a few feet away from the pad site.

From the perspective in Figure 4, it is easy to see the emergency disconnect panel and accompanying electric meter mounted on the bracket attached to the fuel cell. Inside the mechanical room, located just to the right in Figure 4, LOGAN technicians have mounted both the Connected Energy communications hardware and the reverse osmosis water filtration equipment. These components can be seen pictured below in Figure 5.

The building did not originally have commercial high-speed Ethernet service, but the POC was helpful in assisting LOGAN to acquire the service. LOGAN has contracted a local ISP to deliver the service to the facility. The installation plan simulates a critical load application by wiring non-critical circuits in the fire station to a newly mounted fuel cell emergency load panel.

9.0 Electrical System

The Plug Power GenSys 5C PEM fuel cell power plant provides both grid parallel and grid independent operating configurations for site power management. This capability is an important milestone in the development of the GenSys5 as it approaches product commercialization. The unit has a power output of 110/120 VAC at 60 Hz, and when necessary the voltage can be adjusted to 208 VAC or 220 VAC, depending upon actual site conditions. At this site the unit has been connected to the facility in a grid parallel/grid independent configuration, dispatching power

at 2.5 kW for most of the period of performance. The photo below in Figure 6 shows the electrical service panel where the fuel cell will be electrically coupled to the base utility grid at a spare 50-amp circuit breaker cubicle. The electrical closet is conveniently located behind the exterior wall behind the fuel cell pad site. A separate emergency panel has been installed adjacent to this service panel to provide stand-by power from the fuel cell, to support several non-critical loads in the event of a grid failure during the test period. This will provide the opportunity to demonstrate the fuel cell's grid independent capability.

Figure 6 – Main Service Panel for McEntire ANGB Fire Station

10.0 Thermal Recovery System

The thermal recovery system installed by LOGAN at McEntire ANGB implements a new heat exchange technology through the use of Butler Sun Solutions' Solar Wand. LOGAN opted for this heat exchange component in place of the Heliodyne in order to both diversify the GenSys thermal recovery projects and investigate the possible benefits afforded by a different exchanger design. While the Heliodyne has proven highly reliable and efficient in previous GenSys PEM demonstrations, the Solar Wand will allow LOGAN to expand the heat exchange possibilities for future CHP sites.

The Butler Sun Solutions Solar Wand was designed to allow standard hot water tanks to make use of solar heating, but is in any case adaptable to any low-grade heat disposal. The Solar Wand is a double-walled heat exchanger that fits into any full size, 40 gallon and up, domestic hot-water tank. The apparatus screws into the outlet port of a standard hot water tank, providing a new hot water outlet and also fluid input/output connections.

The Solar Wand itself provides approximately two square feet of heat transfer surface inside the tank. The solar collector fluid, in LOGAN's case a mixture of propylene glycol and water, is isolated from the hot water by two copper walls while the space between is vented outside of the tank. The Solar Wand allows the customer to use the existing hot water tank and a single pump to circulate fluid from the heat source to the Solar Wand.

Hot water tanks with built in heat exchangers are not usually available at water heater retail outlets, which makes this component particularly attractive in this application. Figure 7 below shows the Solar Wand component on its own as well as a close-up of the exchanger installed on a fire station water heater.

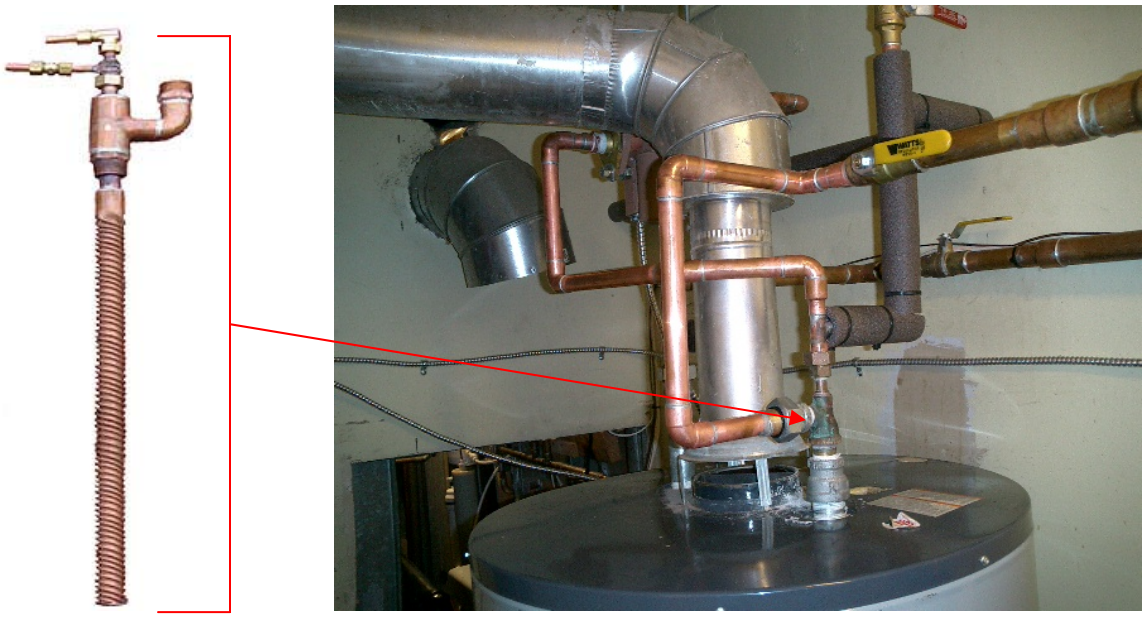

Figure 7 – Solar Wand Installation

11.0 Data Acquisition System

With the help of Nelson McLeod, LOGANEnergy's point of contact at McEntire ANGB, technicians have installed a Connected Energy Corporation web-based SCADA system that provides high-speed access to real-time monitoring of the power plant. The schematic drawing seen below in Figure 8 describes the architecture of the CEC hardware that supports the project. The system provides a comprehensive data acquisition solution and also incorporates remote control, alarming, notification, and reporting functions. The system picks up and displays a number of fuel cell operating parameters on functional display screens including: kWH, cell stack voltage, water management, as well as external instrumentation inputs including Btus, fuel flow, and thermal loop temperatures. CEC's Operations Control Center in Rochester, New York maintains connectivity by means of a Virtual Private Network that will link the fuel cell to the center.

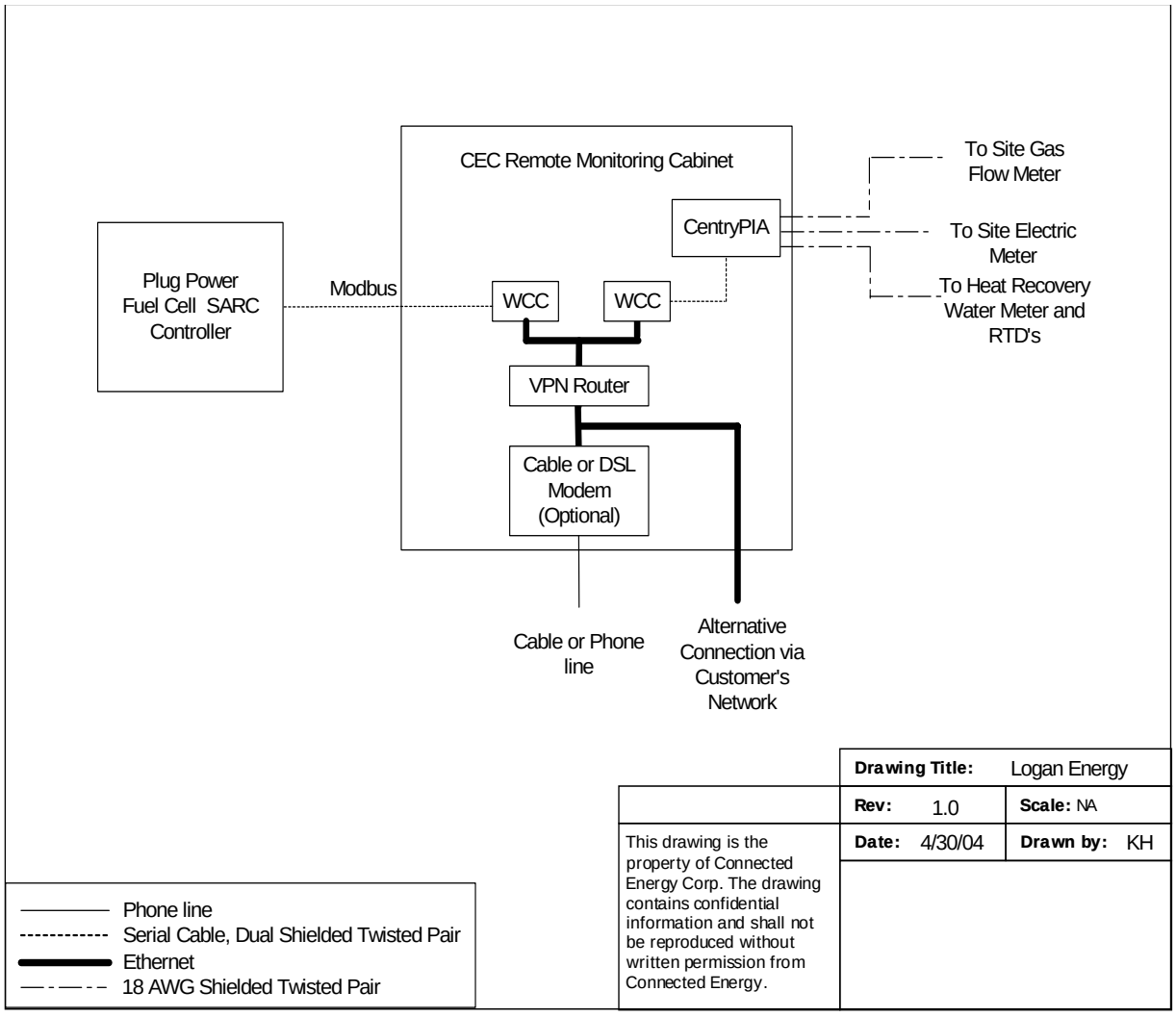

Figure 8 – CEC WEB enabled SCADA Terminal Hardware

As mentioned earlier, LOGAN procured high-speed Internet access to the fuel cell router from a local DSL or cable service provider with the help of POC Nelson McLeod. The base provided a local dial tone to a phone jack that is conveniently located in the mechanical room of the McEntire ANGB Fire Station to provide communications with the fuel cell data modem.

12.0 Fuel Supply System

LOGAN connected the fuel cell gas piping into the existing natural gas service line adjacent to the fuel cell pad, and installed a flow meter to calculate fuel cell usage. The connections and corresponding gas lines can be seen pictured in Figures 3 and 4, above. A regulator at the fuel cell gas inlet maintains the correct fuel cell operating pressure at 14 inches water column.

13.0 Installation Costs

McEntire ANGB Fire Station							
Project Utility Rates			**Utility**				
1) Water (per 1,000 gallons)	$12.13						
2) Utility (per KWH)	$0.0500						
3) Natural Gas (per MCF)	$6.63						
First Cost					**Estimated**	**Actual**	
Plug Power 5 kW GenSys5C					$ 65,000.00	$ 65,000.00	
Shipping					$ 1,800.00	$ 1,060.00	
Installation electrical					$ 1,250.00	$ 924.00	
Installation mechanical & thermal					$ 3,200.00	$ 1,700.00	
Watt Meter, Instrumentation, Web Package					$ 3,150.00	$ 2,950.00	
Site Prep, labor materials					$ 925.00	$ 1,125.00	
Technical Supervision/Start-up					$ 8,500.00	$ 13,860.00	
Total					**$ 83,825.00**	**$ 86,619.00**	
Assume Five Year Simple Payback					$ 16,765.00	$ 17,323.80	
Forcast Operating Expenses	Volume		$/Hr		$/ Yr		
Natural Gas MCF/ hr @ 2.5kW	0.03	$	0.22		$ 1,716.47		
Water Gallons per Year	14,016				$ 170.01		
Total Annual Operating Cost						$ 1,886.49	
Economic Summary							
Forcast Annual kWH			19710				
Annual Cost of Operating Power Plant		$	0.096	kWH			
Credit Thermal Recovery Rate				kWH			
Project Net Operating Cost		$	0.085	kWH			
Displaced Utility cost		$	0.050	kWH			
Energy Savings (Cost)				kWH			
Annual Energy Savings (Cost)							

Explanation of Calculations:

Actual First Cost Total is a *sum* of all the listed first cost components.
Assumed Five Year Simple Payback is the Estimated First Cost Total *divided by* 5 years.

Forecast Operating Expenses:
Natural gas usage in a fuel cell system set at 2.5 kW will consume 0.033 MCF per hour. The cost per hour is 0.033 Mcf per hour *x* the cost of natural gas to the site per MCF at $6.63. The cost per year at $1716.47 is the cost per hour at $0.22 *x* 8760 hours per year *x* 0.9. The 0.9 is for 90% availability.
Natural gas fuel cell systems set at 2.5 kW will consume 1.6 gallons of water per hour through the DI panel. The total volume of water consumed at 14,016 gallons per year is 1.6 gph *x* 8760 hours per year. The cost per year at $170.01 is 14,016 gph *x* cost of water to the site at $12.13 per 1000 gallons.
The Total Annual Operating Cost, $1886.49 is the *sum of* the cost per year for the natural gas and the cost per year for the water consumption.

Economic Summary:
The Forecast Annual kWh at 19,710 kWh is the product of the 2.5 kW set-point for the fuel cell system *x* 8760 hours per year *x* 0.9. The 0.9 is for 90% availability.
The Annual Cost of Operating the Power Plant at $0.096 per kWH is the Total Annual Operating Cost at $1886.49 *divided by* the forecast annual kWh at 19,710 kWh.

The Credit Annual Thermal Recovery at -$0.010 is 7800 *divided by* 3414. This is then *multiplied by* 0.9 *x* 0.1*x* the cost of electricity at $0.0500 per kWh *x* (-1). As a credit to the cost summary, the value is expressed as a negative number.
The Project Net Operating Cost is the *sum* of the Annual Cost of Operating the Power Plant *plus* the Credit Annual Thermal Recovery.
The Displaced Utility Cost is the cost of electricity to McEntire ANGB per kWh.

Energy Savings (cost) equals the Displaced Utility Cost *minus* the Project Net Operating Cost.
Annual Energy Savings (cost) equals the Energy Savings *x* the Forecast Annual kWh.

14.0 Acceptance Test

An 8-hour acceptance test was run on March 3, 2005 by the technician following completion of all the commissioning tasks listed in the Checklist attached below. It was the first successful start-up of the system. Please see Appendix 2 for documentation of the test done by the technician.

Appendix

1) Monthly Performance Data

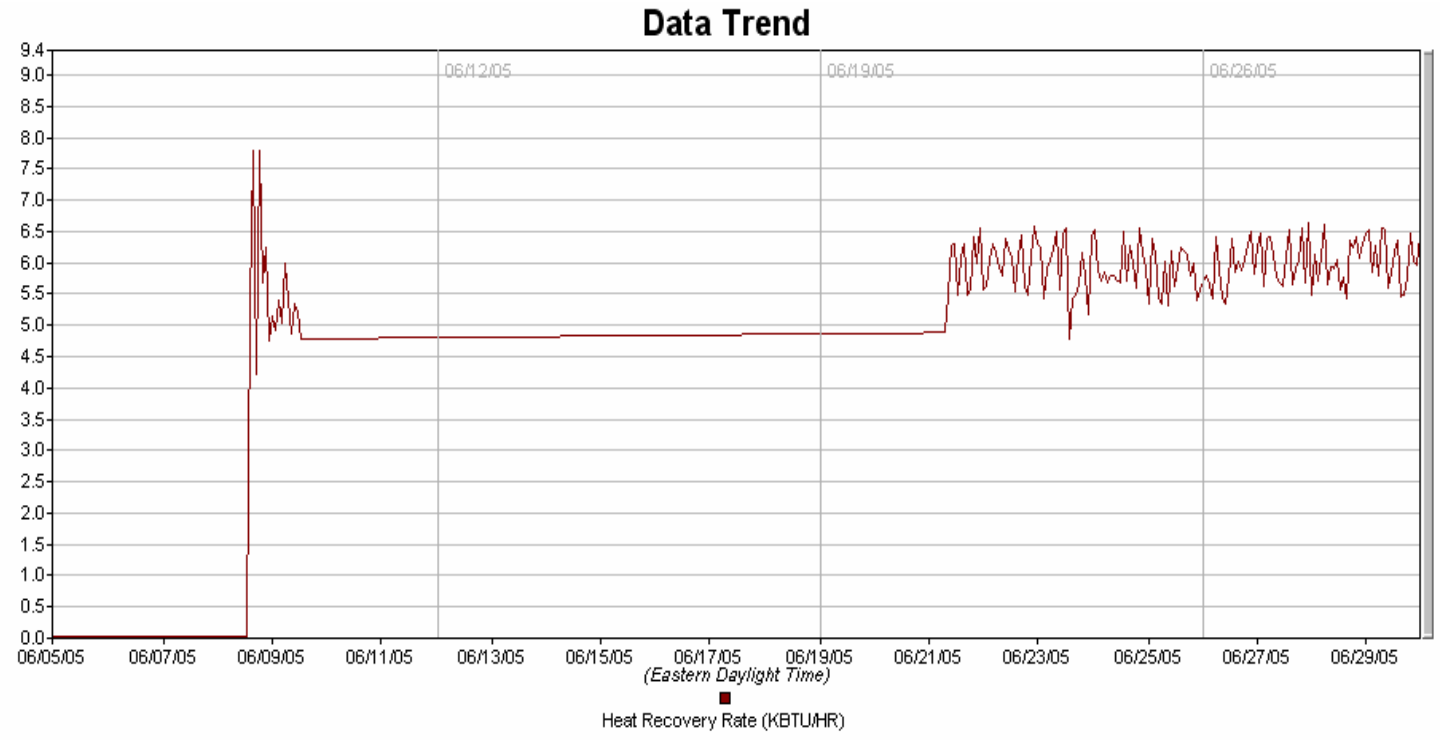

Figure 9 - Fuel Cell Heat Recovery Rate in kBTU/hr for June '05

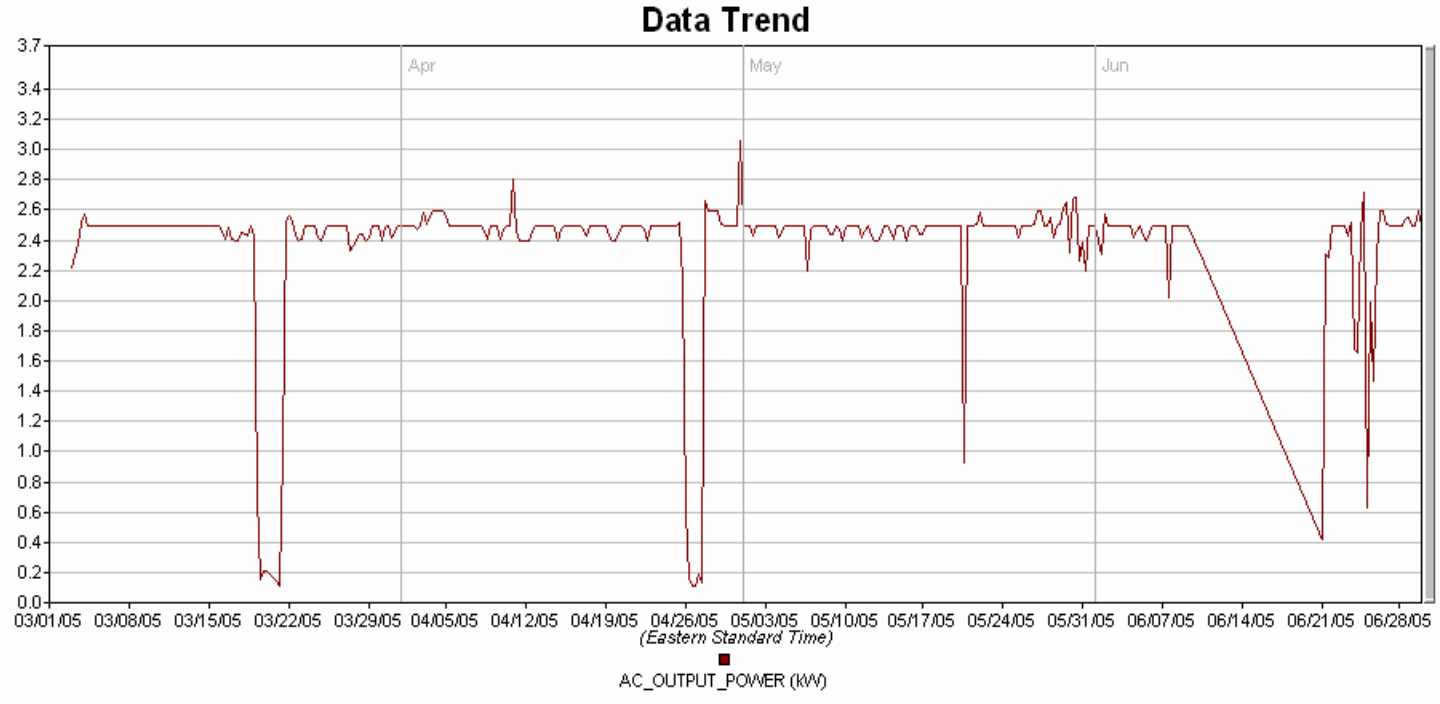

Figure 10 - Fuel Cell A/C Output Power in kW from March '05 – June '05

McEntire ANGB Fire Station									
Columbia, South Carolina									
	Mar-05	Apr-05	May-05	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05
Run Time (Hours)	624	684	744	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Time in Period (Hours)	648	720	744	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Availability (%)	96%	95%	100%	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Energy Produced (kWe-hrs AC)	1642.0	1698.0	1848.0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Output Setting (kW)	2.5	2.5	2.5	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Average Output (kW)	2.63	2.48	2.48	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Capacity Factor (%)	50.68%	47.17%	49.68%	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Fuel Usage, LHV (kWe-hrs AC)	6506.0	6283.0	6887	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Fuel Usage, LHV (BTUs)	2.22E+07	2.14E+07	2.35E+07	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Fuel Usage (SCF)	21945	21193	23231	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Electrical Efficiency (%)	25.25%	27.04%	26.85%	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Thermal Heat Recovery (BTUs)	120920	0	0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Heat Recovery Rate (BTUs/hour)	193.7821	0	0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Thermal Efficiency (%)	0.54%	0.00%	0.00%	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Overall Efficiency (%)	25.80%	27.04%	26.85%	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Number of Scheduled Outages	0	0	0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Scheduled Outage Hours	0	0	0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Number of Unscheduled Outages	1	1	0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Unscheduled Outage Hours	24	36	0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)

2) Documentation of Acceptance Test

Installation / Acceptance Test Report

Site: McEntire ANGB, South Carolina

Installation Check List

TASK	Initials	DATE	TIME (hrs)
Batteries Installed	MH	1/25/05	2
Stack Installed	MH	1/25/05	3
Stack Coolant Installed	MH	1/28/05	1
Air Purged from Stack Coolant	MH	1/28/05	2
Radiator Coolant Installed	MH	2/10/05	3
Air Purged from Radiator Coolant	MH	2/10/05	1
J3 Cable Installed	MH	1/28/05	1
J3 Cable Wiring Tested	MH	1/28/05	0.5
Inverter Power Cable Installed	MH	1/28/05	0.5
Inverter Power Polarity Correct	MH	1/28/05	0.5
RS 232 /Modem Cable Installed	MH	2/10/05	0.5
DI Solenoid Cable Installed with Diode	MH	1/28/05	0.5
Natural Gas Pipe Installed	MH	1/25/05	8
DI Water / Heat Trace Installed	MH	1/28/05	4
Drain Tubing Installed	MH	1/28/05	1

Commissioning Check List and Acceptance Test

TASK	Initials	DATE	TIME (hrs)
Controls Powered Up and Communication OK	MH	2/28/05	4
SARC Name Correct	MH	2/28/05	1
Start-Up Initiated	MH	2/28/05	6
Coolant Leak Checked	MH	2/10/05	1
Flammable Gas Leak Checked	MH	1/28/05	1
Data Logging to Central Computer	MH	2/28/05	2
System Run for 8 Hours with No Failures	MH	3/4/05	8

3) Daily Work Logs
LOGANEnergy Field Technicians
December '04 – April '05

LOGANEnergy Corp.					
Monthly Site Report					
Period	Sep-04				
Site	McEntire				
Engineer	**Date**	**PP S/N**	**Activity**	**Mileage**	**Hours**
Harvell	9/7/2004	324		101	5
			Met with Lt. Col. Nelson McLeod to look at three potential sites for the fuel cell.		
Harvell	9/21/2004	324		102	5
			Met again with McLeod to look more closely at the control tower and fire station		

LOGANEnergy Corp.					
Monthly Site Report					
Period	Dec-04				
Site	McEntire				
Engineer	**Date**	**PP S/N**	**Activity**	**Mileage**	**Hours**
Harvell	12/29/2004	324			25
			Planning. Purchase of materials. Ordering of materials. Hung DI Panel, pre-filter and iron assy, and Connected Energy box.		

LOGANEnergy Corp.					
Monthly Site Report					
Period	Jan-05				
Site	McEntire				
Engineer	**Date**	**PP S/N**	**Activity**	**Mileage**	**Hours**
Harvell	1/17/2005	324			43
			Arranged for forklift to be delivered. Arranged for trailer to be moved from fuel cell pad area. Shipped old parts back to Plug. Made pad. Moved fuel cell into place. Mounted bracket. Mounted disconnect. Took measurements. Made shopping list. Went to pick up circulation pump and expansion tank. Placed decal on FC. Took pictures and sent them. Picked up misc supplies. Dug trench for pipes. Met with Capt. Noble. Tapped into gas line. Installed gas meter and ran line to fuel cell. Chiseled 3"x8" hole through 13" wall. Ran 1-1/4" conduit, 3/4" conduit, 2 PEX lines to outside of bldg. Installed Istec meter. Covered up trench.		
Harvell	1/25/2005	324			33

			Completed gas line. Completed conduit runs along the outside of bldg, through the wall, and to their termination points. Made several trips to Lowes and Home Depot. Designed, built and hung a new style thermal recovery pump assy that has the fill ports built in. Studied solar wand needs and bought necessary parts.		
Harvell	1/28/2005	324			39
			Met with MSgt. Bledsoe to discuss communication issues 3 times during the week. Hired electrician to terminate wires. Ordered therminol which was not shipped with fuel cell. Hung CL panel. Completed work on bracket. Pulled wires. Made control and comm wire terminations in fuel cell and CE box. Installed solar wand and tied into thermal loop. Wired mini-meter. Shopped alot. Worked with electrician. Partially filled thermal loop. Hunted for 60A breaker. Made stack connections and filled with therminol. Electrician completed most of the wiring.		

LOGANEnergy Corp.					
Monthly Site Report					
Period	Feb-05				
Site	McEntire				
Engineer	**Date**	**PP S/N**	**Activity**	**Mileage**	**Hours**
Harvell	2/14/2005	324			20
			2/8/05: Spent time researching and ordering a satellite system that would work for us. 2/9/05: Spent the day cleaning out Yukon, garage, and storage unit of McEntire installation activities. 2/10/05: Went to McEntire to get updates on electrical and phone situation. Completed filling of thermal loop, with much trouble with leaks. 2/11/05: Searched for electrical contractor, to no avail, to finish his work. He seems to have disappeared.		
Harvell	2/26/2005	324			24
			Installed Satellite system and got it working. Tried to configure Connected Energy box but could not get my laptop to communicate with the router. Jesse Perkins sent some cables to alleviate the problem. Will fix next week. Met twice with electrician to annoy him into completing his work. He finally did on Friday afternoon. The base communication division surprised me and had the phone line installed at the end of day Friday. I will be going for a start next week.		
Harvell	2/26/2005	324			20

			Spent the week trying to get the electrician to complete his 3 hours worth of work. He couldn't find the 60A breaker and was sent somewhere else to work. Had to track down his boss to straighten out their avoidance of completing the work. Continued to press the communication issue (phone line) with the base. Contractors are running the conduit but are not finished. Had to find a place for the satellite dish which will be installed next week. Things moving slow at this point.		
Harvell	2/28/2005	324			
			1109618109,2/28/2005 2:15:09 PM,Manual (20)ALERT, PHONE_LINE1_BAD_MODEM_RESPONSE, Error Code: (120)(0)		
			1109618130,2/28/2005 2:15:30 PM,Manual (20)ALERT, PHONE_LINE2_BAD_MODEM_RESPONSE, Error Code: (128)(0)		
			1109618309,2/28/2005 2:18:29 PM,Manual (20)ALERT, PHONE_LINE1_PASSED, Error Code: (115)(0)		
			1109618357,2/28/2005 2:19:17 PM,Manual (20)ALERT, PHONE_LINE2_PASSED, Error Code: (123)(0)		
			1109622280,2/28/2005 3:24:40 PM,ESTOP (107)ESTOP, HW_ESTOP_SARC_L0, Error Code: (534)(0)		

LOGANEnergy Corp.					
Monthly Site Report					
Period	Mar-05				
Site	McEntire				
Engineer	**Date**	**PP S/N**	**Activity**	**Mileage**	**Hours**
Harvell	3/1/2005	324			
			1109690894,3/1/2005 10:28:14 AM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		
			1109694894,3/1/2005 11:34:54 AM,Reformer Warmup (32)SHUTDOWN, LEVS5_HUMID_LOW_SD, Error Code: (377)(0)		
			1109694894,3/1/2005 11:34:54 AM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
			1109695006,3/1/2005 11:36:46 AM,Shutdown Complete (105)ALERT, AUTO_RESTART, Error Code: (603)(0)		

			1109695009,3/1/2005 11:36:49 AM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		
Harvell	3/2/2005	324			
			1109791744,3/2/2005 2:29:04 PM,Unknown (100)ALERT, REMOTE_REQUESTED_SHUTDOWN, Error Code: (600)(0)		
			1109791744,3/2/2005 2:29:04 PM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
			1109792242,3/2/2005 2:37:22 PM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		
			1109793858,3/2/2005 3:04:18 PM,Reformer Warmup (32)SHUTDOWN, FS3_REFORMER_AIR_FLOW_LOW_SD, Error Code: (637)(0)		
			1109793858,3/2/2005 3:04:18 PM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
			1109794032,3/2/2005 3:07:12 PM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		
			1109795040,3/2/2005 3:24:00 PM,Reformer Warmup (32)SHUTDOWN, FS3_REFORMER_AIR_FLOW_LOW_SD, Error Code: (637)(0)		
			1109795040,3/2/2005 3:24:00 PM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
			1109796221,3/2/2005 3:43:41 PM,ESTOP (107)ESTOP, HW_ESTOP_SARC_L0, Error Code: (534)(0)		
			1109796708,3/2/2005 3:51:48 PM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		
			1109797640,3/2/2005 4:07:20 PM,Reformer Warmup (32)SHUTDOWN, TC10_ATO_1_HIGH_SD, Error Code: (313)(0)		
			1109797640,3/2/2005 4:07:20 PM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
			1109797860,3/2/2005 4:11:00 PM,Manual (20)ALERT, ABORT_DATA_TRANSFER, Error Code: (131)(0)		
			1109798029,3/2/2005 4:13:49 PM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		

			1109798208,3/2/2005 4:16:48 PM,Reformer Purge (31)SHUTDOWN, SOL1_FUEL_VALVE_FAILED_CLOSED, Error Code: (623)(0)		
			1109798208,3/2/2005 4:16:48 PM,Unknown (100)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
Harvell	3/8/2005	324			22
			Installed new software update (1.31). Commissioned RO filter. Encountered severe inverter set point loading problems. Repaired leak in glycol side of DI bundle. Charged batteries. Started up on Monday, but had to shut down on Wed. to enable modbus. This caused 4 shutdowns when trying to restart. Worked with Jesse Perkins to get CE box working.		
Harvell	3/10/2005	324			
			1110461866,3/10/2005 8:37:46 AM,Running (51)ALERT, TC1_CPO_HIGH_ALERT, Error Code: (257)(0)		
			1110461871,3/10/2005 8:37:51 AM,Running (51)SHUTDOWN, TC10_ATO_1_LOW_SD, Error Code: (310)(0)		
			1110461871,3/10/2005 8:37:51 AM,Unknown (100)SHUTDOWN, TC11_ATO_2_LOW_SD, Error Code: (315)(0)		
			1110461872,3/10/2005 8:37:52 AM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
Harvell	3/14/2005	324			5
			Fuel cell had restarted when I arrived at McEntire. There was an apparent drop in gas pressure that may have caused the high CPO and low ATO temps. This is something I will watch for in the future. I reset the CE box so Mark Ginther could log on.		
Harvell	3/19/2005	324			
			1111233941,3/19/2005 7:05:41 AM,Running (51)SHUTDOWN, LEVS5_HUMID_LOW_SD, Error Code: (377)(0)		
			1111233941,3/19/2005 7:05:41 AM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
Harvell	3/21/2005	324			21
			Electric and Btu Meter not communicating with website.		

			Retraced all wiring to make sure connections were good. Electric meter began pulsing with little more than switching the wires on the terminals. The Istec was another story. After several calls to CE and Istec, it began to pulse, but only for a few hours, then nothing. Another trip on Friday didn't help anything. There is still a pulse issue with the Istec.		
Harvell	3/28/2005	324			7
			DI flow insufficient. Changed particular pre-filter and RO. Both were brown. RO demise was premature.		

LOGANEnergy Corp.					
Monthly Site Report					
Period	Apr-05				
Site	McEntire				
Engineer	**Date**	**PP S/N**	**Activity**	**Mileage**	**Hours**
Harvell	4/2/2005	324			
			1112462522,4/2/2005 12:22:02 PM,Running (51)ALERT, GRID_LOSS, Error Code: (632)(0)		
			1112462522,4/2/2005 12:22:02 PM,Running (51)ALERT, SYSTEM_TRANSITIONED_TO_STANDBY, Error Code: (630)(0)		
			1112462524,4/2/2005 12:22:04 PM,Run-GL-SB (53)ALERT, SYSTEM_TRANSITIONED_TO_GRID, Error Code: (631)(0)		
Harvell	4/9/2005	324			
			1113056443,4/9/2005 10:20:43 AM,Running (51)ALERT, ABORT_DATA_TRANSFER, Error Code: (131)(0)		
Harvell	4/10/2005	324			
			1113142843,4/10/2005 10:20:43 AM,Running (51)ALERT, ABORT_DATA_TRANSFER, Error Code: (131)(0)		
			1113170960,4/10/2005 6:09:20 PM,Running (51)ALERT, LOW_CELL_TRIP_ALERT, Error Code: (500)(0)		
Harvell	4/11/2005	324			
			1113229243,4/11/2005 10:20:43 AM,Running (51)ALERT, ABORT_DATA_TRANSFER, Error Code: (131)(0)		
Harvell	4/12/2005	324			
			1113315643,4/12/2005 10:20:43 AM,Running (51)ALERT, ABORT_DATA_TRANSFER, Error Code: (131)(0)		
Harvell	4/26/2005	324			

			1114490745,4/26/2005 12:45:45 AM,Running (51)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		
			1114493710,4/26/2005 1:35:10 AM,Running (51)ALERT, TC1_CPO_HIGH_ALERT, Error Code: (257)(0)		
			1114493862,4/26/2005 1:37:42 AM,Running (51)ALERT, TC2A_CPO_OUT_HIGH_ALERT, Error Code: (267)(0)		
			1114494362,4/26/2005 1:46:02 AM,Running (51)SHUTDOWN, TC1_CPO_HIGH_SD, Error Code: (258)(0)		
			1114494362,4/26/2005 1:46:02 AM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
			1114494477,4/26/2005 1:47:57 AM,Shutdown Complete (105)ALERT, AUTO_RESTART, Error Code: (603)(0)		
			1114494480,4/26/2005 1:48:00 AM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		
			1114509296,4/26/2005 5:54:56 AM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		
			1114509475,4/26/2005 5:57:55 AM,Reformer Purge (31)SHUTDOWN, SOL1_FUEL_VALVE_FAILED_CLOSED, Error Code: (623)(0)		
			1114509475,4/26/2005 5:57:55 AM,Unknown (100)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		